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# USSR Report

EARTH SCIENCES

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31 March 1986

## USSR REPORT EARTH SCIENCES

### CONTENTS

#### METEOROLOGY

- Soviet-Vietnamese Studies of Typhoons From Research Ship  
(A. Melnikov; PRAVDA, 18 Dec 85)..... 1
- Selection of Method for Calculating Scattering of  
Impurities in Atmosphere in Standardizing Release of  
Radionuclides From High Sources  
(N. Ye. Artemova; ATOMNAYA ENERGIYA, No 3, Sep 85)..... 2

#### OCEANOGRAPHY

- Work Off U.S. West Coast Planned for Research Ship 'Vityaz'  
(G. Kurov; IZVESTIYA, 17 Dec 85)..... 3
- New Airborne Laser Fluorimeter Tested Successfully  
(DOMESTIC SERVICE, 6 Jan 85)..... 4
- Research Ship 'Shtokman' in Indian Ocean for UNESCO Study  
(VECHERNYAYA MOSKVA, 31 Dec 85)..... 5
- Prize-Winning Work on Laser Diagnosis of Water Environments  
(T. Korsakora; KOMSOMOLSKAYA PRAVDA, 5 Dec 85)..... 6
- Geological-Geomorphological and Biological Studies in  
Caribbean Sea Using Underwater Apparatus (Third Cruise of  
Scientific Research Vessel 'Rift,' 14 August-13 September  
1983)  
(V. P. Nikolayev, V. V. Bulyga, et al.; OKEANOLOGIYA,  
No 5, Sep-Oct 85)..... 7

Expeditionary Studies in the Tropical Atlantic Ocean During the 28th Cruise of the Research Vessel 'Akademik Vernadskiy' (Ye. F. Shnyukov, V. K. Kosnyrev, et al.; OKEANOLOGIYA, No 5, Sep-Oct 85).....	8
Fortieth Cruise of Research Vessel 'Akademik Kurchatov' (V. I. Voytov; OKEANOLOGIYA, No 5, Sep-Oct 85).....	8
Determination of Individual Mass of Copepoda by Body Proportions (V. I. Kuzmicheva; OKEANOLOGIYA, No 5, Sep-Oct 85).....	9
Continuous Seismic Profiling While Drifting (V. N. Moskalenko; OKEANOLOGIYA, No 5, Sep-Oct 85).....	9
Acoustic Method of Estimating Concentration of Nodules on Ocean Floor (Yu. Yu. Zhitkovskiy, A. I. Zotov, et al.; OKEANOLOGIYA, No 5, Sep-Oct 85).....	10
Mesoplankton Along Bulgarian Coast (E. I. Musayeva; OKEANOLOGIYA, No 5, Sep-Oct 85).....	10
Geomorphology of Northern and Central Parts of Shirshov Ridge (Bering Sea) (Yu. D. Yevsyukov, K. I. Sigova; OKEANOLOGIYA, No 5, Sep-Oct 85).....	11
Hydrocarbons in Water and Suspensions in Pacific Ocean and Bering Sea (I. A. Nemirovskaya; OKEANOLOGIYA, No 5, Sep-Oct 85).....	11
Formation of Todorokite and Bernessite in Fe-Mn Nodules of the Black Sea (L. Ye. Shterenberg, A. I. Gorshkov, et al.; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA, No 7, Jul 85).....	12
Lower Miocene Diatoms of the Tropical West Pacific (E. P. Radionova; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA, No 7, Jul 85).....	13
Amphibolites of Shirshov Ridge (Bering Sea) (R. M. Yurkova, A. A. Peyve, et al.; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA, No 7, Jul 85).....	13
Formation Categories of Oceans and Seas (Yu. M. Pushcharovskiy; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA, No 7, Jul 85).....	14

Nature of Gravity Anomalies in Kuril-Kamchatka Arc-Trench- Ocean System, Exemplified in Southern Kuril Arc (V. D. Poberezhnyy, V. N. Senachin, et al.; TIKHOOKEANSKAYA GEOLOGIYA, No 4, Jul-Aug 85).....	15
Dynamics of Contemporary Sedimentation and History of Development of Great Gamov Canyon (Sea of Japan) Based on Underwater Observations (A. S. Astakhov, V. I. Vasilyev; TIKHOOKEANSKAYA GEOLOGIYA, No 4, Jul-Aug 85).....	15
Crustal Models for Various Pacific Ocean Bed Structures (G. I. Semenova; TIKHOOKEANSKAYA GEOLOGIYA, No 4, Jul-Aug 85).....	16
Probable Influence of Kuroshio Current on Distribution of Radiolarian Shells in Bottom Deposits (I. M. Popova; TIKHOOKEANSKAYA GEOLOGIYA, No 4, Jul-Aug 85).....	17
Determination of Thickness of Marine Sandy Sediment Wave Agitation Layer by Static Soundings (N. A. Bogdanov, F. A. Kadik; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA, No 9, Sep 85).....	17
Sedimentation Bodies of Somalian Abyssal Trench Based on Seismostratigraphic Analysis of Geophysical and Deep Drilling Data (A. Ye. Shlezinger, L. Ye. Shterenberg; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA, No 9, Sep 85).....	18
Determination of Effective Viscosity in Finite-Dimensional Cascade Turbulence Models (Ye. B. Gledzer, A. L. Makarov; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA, No 9, Sep 85).....	19
Structure and Mineralogical Composition of Deep-Water Tropical Atlantic Corals (A. F. Khmel'nitskiy, S. A. Kozak; DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI, No 8, Aug 85).....	19
Method for Determining Technical Parameters of Hydraulic Impact Drive for Underwater Drilling (I. G. Shelkovnikov, V. Ya. Kipovskiy, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA, No 8, Aug 85).....	20

Principles of Tectonic Regionalization and Description of Structural Elements on Tectonic Maps of Water Area (Yu. A. Kosygin, V. A. Kulyndyshev; GEOTEKTONIKA, No 5, Sep-Oct 85).....	20
New Data on Deep Structure of Mid-Atlantic Ridge at 20°S (Yu. M. Pushcharovskiy, I. N. Yelynikov, et al.; GEOTEKTONIKA, No 5, Sep-Oct 85).....	21
Specifics of Development of Spreading Zones in Contemporary and Paleooceanic Structures (A. S. Perfilyev, V. V. Kopteva, et al.; GEOTEKTONIKA, No 5, Sep-Oct 85).....	22
Deep Magnetic Diapirism of Cuba and Its Structural Significance. Part 1 (V. G. Bovenko, Yu. P. Orovetzkiy, et al.; GEOFIZICHESKIY ZHURNAL, No 5, Sep-Oct 85).....	23
Density Model of Indian Ocean Mantle (O. M. Rusakov; GEOFIZICHESKIY ZHURNAL, No 5, Sep-Oct 85).....	23
Relationship of Distribution of Hydrochemical Characteristics to Structure and Dynamics of Baltic Sea Waters (V. V. Kazaryan, V. P. Korovin, et al.; VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA, No 21, Sep 85).....	24
Monsoon Variability of Thermohaline Fields and Circulation of Waters in Main Pycnocline in Northwestern Indian Ocean (V. V. Klepikov; VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA, No 21, Sep 85).....	25
Geochemical Characteristics of Authigenic Iron Sulfides in Black and Caspian Seas (T. V. Volkova, A. Yu. Mitropolskiy; GEOLOGICHESKIY ZHURNAL, No 5, Sep-Oct 85).....	25
Heat Flow Through Bottom in Western Black Sea (A. D. Duchkov, S. A. Kazantsev; GEOLOGIYA I GEOFIZIKA, No 8, Aug 85).....	26
Hydrocarbon Gas-Hydrate Formation Beneath Bottom of Seas and Oceans (V. Ya. Trotsyuk, I. A. Nemirovskaya; DOKLADY AKADEMII NAUK SSSR, No 4, Oct 85).....	27

Concentration of Elements in Ocean as Geochemical Factor (V. D. Korzh; DOKLADY AKADEMII NAUK SSSR, No 4, Oct 85).....	27
Example of Equivalency of Density Stratification and Rotation Effects (V. A. Vladimirov; DOKLADY AKADEMII NAUK SSSR, No 2, Sep 85).....	28
Geology of San Vicente Island (Cape Verde Archipelago) (M. A. Akhmetiev, V. I. Koporulin, et al.; DOKLADY AKADEMII NAUK SSSR, No 2, Sep 85).....	29
New Mineral Varieties of Hydrotalcite-Manasocite Group-- Products of Low-Temperature Conversion of Basalts and Volcanogenic-Sedimentary Rocks on Ocean Floor (V. A. Drits, N. A. Lisitsyna, et al.; DOKLADY AKADEMII NAUK SSSR, No 2, Sep 85).....	29
Magmatism of Major Ocean Morphostructures and Certain Geodynamic Aspects of Its Manifestation (Ye. V. Sharkov, A. A. Tsvetkov; DOKLADY AKADEMII NAUK SSSR, No 2, Sep 85).....	30
North Atlantic Upper Mantle Heterogeneities (N. Ya. Kunin, S. V. Usenko; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI, No 9, Sep 85).....	31
Geothermal Studies in Central Indian Ocean Basin (L. L. Vanyan, A. M. Gorodnitskiy, et al.; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI, No 9, Sep 85).....	31
Scattering Matrix and Integrability of Classical Wave Systems With Additional Motion Integral (V. Ye. Zakharov, Ye. I. Shulman; DOKLADY AKADEMII NAUK SSSR, No 6, Aug 85).....	32
Possibilities of Acoustic Thermography of Biological Objects (Yu. V. Gulyayev, E. E. Godik, et al.; DOKLADY AKADEMII NAUK SSSR, No 6, Aug 85).....	32
Marine Landscape Studies: New Approach to Study of Ocean Environment (D. Ye. Gershanovich, V. V. Fedorov; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOGRAFICHESKAYA, No 5, Sep-Oct 85).....	33

## TERRESTRIAL GEOPHYSICS

Active Kamchatka Volcano Studied (TASS, 14 Dec 85).....	34
Seismic Prospecting Without Blasting Tested (TASS, 23 Dec 85).....	35
Structural Elements on Kamchatka Revealed by Anomalous Magnetic Field (V. M. Zimin; TIKHOOKEANSKAYA GEOLOGIYA, No 4, Jul-Aug 85).....	36
Layers of Increased Conductivity in Crust and Upper Mantle Beneath Kamchatka (Yu. F. Moroz; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI, No 9, Sep 85).....	36

## PHYSICS OF ATMOSPHERE

Sound Field of a Point Source in Stratified Moving Two- Component Medium (V. Ye. Ostashev; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA, No 9, Sep 85).....	38
Transfer of Radiation in Model of Broken Cloud Cover Constructed on the Basis of Poisson Point Flux (G. A. Titov; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA, No 9, Sep 85).....	38
Light Scattering in Atmosphere With Nonorthotropic Underlying Surface (V. A. Zubov, I. N. Minin; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA, No 9, Sep 85).....	39
Planning of Experiment in Problem of Estimating Intensity of Pollution Sources (V. V. Penenko, V. F. Raputa, et al.; IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA, No 9, Sep 85).....	39

## ARTIC AND ANTARCTIC RESEARCH

Hydrochemical Indicators of Frontal Cyclonic Eddy in Antarctic Circumpolar Current (A. M. Chernyakova, S. O. Borodkin; OKEANOLOGIYA, No 5, Sep-Oct 85).....	41
Relationship of Elastic Moduli of Moisture-Saturated Frozen Sandy-Clayey Rocks and Ice (A. D. Frolov; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA, No 8, Aug 85).....	41



Impact Fracture of Ice (V. P. Yepifanov; DOKLADY AKADEMII NAUK SSSR, No 3, Sep 85).....	42
Geodynamic Reconstructions as Method for Predicting Oil and Gas Content of Poorly Studied Regions (as Exemplified by Antarctic) (Ye. R. Aliyeva, Ye. V. Kucheruk; IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA, No 9, Sep 85).....	43
New Arctic Drifting Station, SP-28, Planned (A. Ryabushev; IZVESTIYA, 29 Nov 85).....	44
Divers in Pressure Chamber on Board Vessel 'Sprut' (MEDITSINSKAYA GAZETA, 18 Dec 85).....	45
IL-18D Airplane Used in Antarctic Exploration and Transport (T. Nikitina; VOZDUSHNYY TRANSPORT, 21 Dec 85).....	46
SP-28 Arctic Drifting Station to Start Operation in April (I. Podshivalov; SOVETSKAYA ROSSIYA, 28 Dec 85).....	47

## METEOROLOGY

### SOVIET-VIETNAMESE STUDIES OF TYPHOONS FROM RESEARCH SHIP

Moscow PRAVDA in Russian 18 Dec 85 p 6

[Article by A. Melnikov, Vladirostok]

[Excerpt] For nearly four months, an international crew studied typhoons that are spawned in the South China Sea.

Soviet scientists were joined by meteorologists of Vietnam on board the vessel "Priboy" of the Far Eastern Scientific Research Institute of the USSR State Committee on Hydrometeorology and Monitoring of the Natural Environment. Research was conducted in line with a program of a Soviet-Vietnamese laboratory for study of tropical cyclones.

The cruise proved to be very useful for specialists of both countries, who have been engaged in joint studies of this important problem for five years. The material that was gathered contains information for the development of a method of predicting typhoons.

"From the scientific standpoint," related Candidate of Geographical Sciences N. Lisogurskiy, the head of the expedition, "the latest cruise produced more than previous cruises did. For example, in August, which is the traditional 'typhoon month,' not a single one was spawned. But in September, when the ship was in the Pacific Ocean, there were six tropical cyclones, four of which reached the Soviet Far East. It happened that the ship was located in the center of one of them, which was named 'Val,' at the moment that it formed. This provided us with a wealth of information for the study of conditions of the origin and evolution of tropical cyclones."

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SELECTION OF METHOD FOR CALCULATING SCATTERING OF IMPURITIES IN ATMOSPHERE  
IN STANDARDIZING RELEASE OF RADIONUCLIDES FROM HIGH SOURCES

Moscow ATOMNAYA ENERGIYA in Russian Vol 59, No 3, Sep 85  
(manuscript received 13 Aug 84) pp 216-221

ARTEMOVA, N. Ye.

[Abstract] Well-established methods exist in the USSR for calculating necessary smokestack height and maximum admissible emissions to maintain the maximum admissible concentration of harmful substances near the ground in the area surrounding an industrial enterprise or power plant for chemical substances and compounds for which maximum admissible concentrations exist. This article discusses methods suitable for making equivalent determination for radioactive elements. The modifications of the Gaussian model of dispersion of radionuclides around a source utilized in the USSR have not been tested at specific sites or in special experiments. The method of calculating the dilution factor developed by the State Committee for Hydrometeorology is recommended for formulating methods for standardizing the emission of radionuclides. The method is oriented toward definition of scientifically well-founded emission levels to assure radiation safety standards are not exceeded under any weather conditions. All types of continuously acting high sources are covered by the method. Details of the method are not described. Figures 3, tables 2; references 19: 12 Russian, 7 Western. [44-6508/12947]

## OCEANOGRAPHY

### WORK OFF U.S. WEST COAST PLANNED FOR RESEARCH SHIP 'VITYAZ'

Moscow IZVESTIYA in Russian 17 Dec 85 p 6

[Article by G. Kurov, Novorossiysk]

[Text] The crew of the scientific research ship "Vityaz" has completed an anniversary cruise, its 10th. The last days of 1985 are again busy ones: the "Vityaz" will set out shortly on a new expedition.

Senior mate Yuriy Sergeyevich Yefanov told about what the crew of the "Vityaz" worked on during its last cruise, and what is in prospect for the new cruise.

"The 'Vityaz' worked in the Central Atlantic, off the coast of Western Sahara, and in the Mediterranean Sea. The mighty Gulf Stream ocean current or, more precisely, processes of heat exchange between it and the atmosphere, became a main object of research.

"A substantial portion of our work was done in the area of the Bermuda Triangle. A drop in the temperatures of deep currents as compared with readings obtained in 1984 from the 'Akademik Kurchatov' was recorded, and a number of other interesting observations were made.

"We shall set out on our next cruise, the 11th, in the first days of the new year. It will be the first time in the Pacific Ocean for the new 'Vityaz'. We shall work in the vicinity of the California coast, which is a promising area for specialists in the fields of deep currents, global tectonics, and marine fauna."

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CSO: 1865/116

# NEW AIRBORNE LASER FLUORIMETER TESTED SUCCESSFULLY

Moscow DOMESTIC SERVICE in Russian 1300 gmt 6 Jan 85

[Summary] Scientists at Yerevan University have created a new laser instrument, a fluorimeter, designed for research in water environments. The reflected beam of the laser breaks down into sixteen colours, which carry onto a display data about the capacity of reservoirs, their plant life and the composition of organic matter. The data is processed by a microcomputer. The instrument may be used to probe rivers, lakes and seas from aboard a helicopter or a plane. It was tested successfully in the course of research in the Baltic Sea at the Klaipeda Hydrometeorological Observatory and with its help biological research was carried out at the mountain Lake Sevan in Armenia.

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CSO: 1865/147-E

RESEARCH SHIP 'SHTOKMAN' IN INDIAN OCEAN FOR UNESCO STUDY

Moscow VECHERNYAYA MOSKVA in Russian 31 Dec 85 p 2

[Excerpt] From on board the scientific research ship "Professor Shtokman" of the USSR Academy of Sciences' Oceanology Institute imeni Shirshov, expedition leader Yu. Pavlidis reported to us today:

"Our expedition is heading for work to be done under a UNESCO program. We will conduct geological and geophysical studies of the shelf zones of countries which are located in the western part of the Indian Ocean.

"Taking part in the expedition are 12 Moscow scientists--from the Oceanology Institute, Moscow State University, and the USSR Academy of Sciences' Geography Institute, as well as specialists from the German Democratic Republic. Very soon, we will take on board an oceanologist from France.

"This ship has already passed through the Red Sea and the Gulf of Aden and entered the Indian Ocean. Today, we passed the island of Socotra.

"We are tuning up instruments and getting ready for research in the first area--the Seychelles Bank."

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CSO: 1865/154

PRIZE-WINNING WORK ON LASER DIAGNOSIS OF WATER ENVIRONMENTS

Moscow KOMSOMOLSKAYA PRAVDA in Russian 5 Dec 85 p 1

[Article by T. Korsakora]

[Abstract] The article salutes a group of scientists who were recently awarded the Leninist Communist Youth League Prize for development of laser methods for diagnosing the condition of natural water environments. Yevgeniy Baulin, Andrey Abroskin, Azret Bekkiyev, Andrey Demidov, Olga Kalaydzidis, Tatyana Gogolinskaya, Valeriy Slobodyanin and Aleksandr Chekalyuk are identified as the members of this group. They worked under the direction of Doctor of Physical-Mathematical Sciences Viktor Vladimirovich Fadeyev. It is noted that the majority of the group's members are or have been associated with the Chair of Quantum Radiophysics of Moscow State University's School of Physics. This chair is headed by Academician Leonid Veniaminovich Keldysh.

It is recalled that the idea of using lasers for the study of biological objects was proposed by Academician Rem Viktorovich Khokhlov. Work on the new diagnostic methods began about 10 years ago. These methods are said to employ a laser carried on a research ship. This laser emits a green light pulse, which is reflected by the water. The presence and type of impurities in the water are indicated by the color of the reflected light. Work on the development and testing of the laser methods was done in a laboratory and then during cruises to the tropics.

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CSO: 1865/116

GEOLOGICAL-GEOMORPHOLOGICAL AND BIOLOGICAL STUDIES IN CARIBBEAN SEA USING  
UNDERWATER APPARATUS (THIRD CRUISE OF SCIENTIFIC RESEARCH VESSEL 'RIFT,'  
14 AUGUST-13 SEPTEMBER 1983)

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85 pp 876-879

NIKOLAYEV, V. P., BULYGA, V. V., POPOV, V. A., FOYO, Kh. and KLARO, R.

[Abstract] The major scientific tasks of the expedition mentioned in the title, planned on the basis of a suggestion by the Oceanology Institute, Cuban Academy of Sciences, included: study of the geological-geomorphological structure of the boundary of the shelf and island slope; determination of the significance of submarine canyons in the dynamics of bottom sediments; determination of the species composition, zonality and certain aspects of behavior of fish and invertebrates and determination of the influence of environmental factors on the composition and distribution of island slope biocoenoses. The cruise involved the use of an autonomous manned submersible called "Argus" and a deep-water towed apparatus, the "Zvuk-4M." Studies were restricted to an area immediately around the island of Cuba, extending from Matanzas around the western end of the island to Trinidad. During 39 days spent around the island, "Argus" performed 45 dives to as deep as 600 m and the "Zvuk-4M" descended 18 times to as deep as 1,200 m, making over 6,000 underwater photographs and bringing up more than 40 biological and geological specimens, as well as several objects of archeological interest. Significant variations in steepness of the island slope with depth were observed in all areas studied. For the first time in Cuban waters, direct observations of the distribution, composition and certain aspects of ecology of fauna on the island slope at depths of 30 to 600 m allowed estimation of the number and distribution of individual benthos organizations over extensive areas. On one dive, the "Argus" observed what appeared to be the remains of a submerged city, with walls, collapsed roofs, open rectangular areas and arches on Ampere Seamount. Figures 3.

[72-6508/12947]



EXPEDITIONARY STUDIES IN THE TROPICAL ATLANTIC OCEAN DURING THE 28TH CRUISE  
OF THE RESEARCH VESSEL 'AKADEMIK VERNADSKIY'

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85 pp 874-876

SHNYUKOV, Ye. F., KOSNYREV, V. K., STAROSTENKO, V. I., MOISEYEV, G. A.,  
MITROPOLSKIY, A. Yu. and REPETYN, L. N.

[Abstract] In January-April of 1984 the marine Hydrophysics Institute, Ukrainian Academy of Sciences, undertook expeditionary studies in the tropical Atlantic as a part of the interdepartmental program studying the interaction between the atmosphere and ocean in order to develop long-range weather forecasts and climate theory. The studies were concentrated in the Amazon tropical energy-active zone, the shelf zone of Guinea, the transoceanic cross-section along 12°N and in the areas of transform faults of the Mid-Atlantic Ridge. An extensive range of hydrophysical, hydrochemical, geological, geochemical and geophysical studies was undertaken, as well as studies of the influence of sea water on the corrosive properties of materials and coatings. Two hundred sixty-two drift stations were occupied, studying the structure of hydrophysical and hydrochemical fields down to 2,000 m depth. Bottom samples were taken at 120 of these stations, and at 40 the precise vertical structure of the temperature field and conductivity (salinity) were measured. Eleven drifting buoy stations were used to measure currents and water temperatures. Geophysical studies of the gravity and magnetic fields were performed throughout the entire cruise. The data obtained in the Amazon area convincingly indicate that this area of the tropical Atlantic is an important energy-active zone from the standpoint of advective heat and mass transfer processes. Figures 1.

[72-6508/12947]

FORTIETH CRUISE OF RESEARCH VESSEL 'AKADEMIK KURCHATOV'

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85 pp 872-874

VOYTOV, V. I.

[Abstract] The 40th cruise of the "Akademik Kurchatov" covered the western and tropical Atlantic in the northern hemisphere between 9 August and 22 November 1984. The cruise was 20,000 nautical miles in length, with 168 measurement stations, many of which were occupied in an area in the Gulf Stream at about 38°N, 65°W off the coast of North America. Weather and actinometric observations as well as hydrologic studies were performed in this area. Results of the studies indicated that the ocean transmits heat into the atmosphere in the area the same as in the winter, though less intensely. In an open ocean area at about 22°N, 38°W, studies with a 3-module muon detector recorded cosmic particle fluxes at depths of 1500 to 600 m, both vertically and at an angle of up to 45°. Figures 1.

[72-6508/12947]

## DETERMINATION OF INDIVIDUAL MASS OF COPEPODA BY BODY PROPORTIONS

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85  
(manuscript received 4 Aug 83) pp 867-871

KUZMICHEVA, V. I. All-Union Fishing and Oceanography Scientific Research  
Institute, Moscow

[Abstract] Previous studies have suggested methods for determining the weight of copepods by measuring body size and proportions, referring to nomograms to determine body volume and assuming that density is equal to one. The method is evaluated by referring to raw data published by previous authors. The dimensions reported in these other studies were used to find the  $L/l$  and  $c/l$  ratios, determine the body proportion coefficient and calculate mass. The quantities thus calculated were compared to the actual volumes and mass as determined by weighing. Mass was found to be some 6.8% greater than volume. Another correlation is observed over a broad range of sizes and species, with slightly greater dispersion for the smallest animals, probably resulting from the different research techniques employed. Figures 2, tables 2; references: 14 Russian.  
[72-6508/12947]

UDC 550.834

## CONTINUOUS SEISMIC PROFILING WHILE DRIFTING

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85  
(manuscript received 29 Sep 83, after revision 15 May 84) pp 861-866

MOSKALENKO, V. N., Southern Division, Oceanology Institute imeni P. P.  
Shirshov, USSR Academy of Sciences, Gelendzhik

[Abstract] Continuous seismic profiling while drifting is a very valuable method, yielding information on bottom structure in the area where geological samples are brought up, allowing correlation of rock specimens with seismic profiles. This requires that two types of seismic apparatus be on board: one for operation with the ship under way, another for operation at geological stations with the ship drifting. The receiving systems used for the two situations are quite different. During the 14th and 25th cruises of the research vessel "Dmitriy Mendeleev," such work was performed, demonstrating its possibility in principle. These operations are described. The combination of profiles while under power and while drifting allows regional seismic cross-sections to be obtained without gaps in the most important areas, those where geological operations are performed and samples taken while drifting. Figures 1; references: 4 Russian.  
[72-6508/12947]

## ACOUSTIC METHOD OF ESTIMATING CONCENTRATION OF NODULES ON OCEAN FLOOR

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85  
(manuscript received 24 May 84; after revision 22 Aug 84) pp 856-860

ZHITKOVSKIY, Yu. Yu., ZOTOV, A. I., KRASNOBORODKO, V. V., FOKIN, A. V. and  
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[Abstract] The method for estimating the concentration of nodules on the ocean floor by the amount of penetration of sound into the floor has been known for some time. The authors suggest a method based on studies of the characteristics of acoustic signals backscattered by the ocean floor. Field studies were made in a number of areas in the Pacific Ocean at about 4,000 m to determine the specifics of backscattering of sound from a bottom covered with nodules. Studies involved both standard echo soundings at 12 kilohertz with a spherical hydrophone located at a depth of 100 m and pulse soundings with a deep-water acoustic system suspended 10 to 60 m above the bottom. The results confirm that measurement of the statistical characteristics of acoustic signals scattered by the bottom can be successfully used to estimate the density of ferromanganese nodules on the bottom. Studies can be made from the ocean surface with the prospecting ship in motion. Figures 2; references 4: 3 Russian, 1 Western.  
[72-6508/12947]

UDC 577.475(262.5)

## MESOPLANKTON ALONG BULGARIAN COAST

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85  
(manuscript received 6 Mar 84; after revision 27 Jun 84) pp 832-838

MUSAYEVA, E. I., Oceanology Institute imeni P. P. Shirshov, USSR Academy  
of Sciences, Moscow

[Abstract] A study was made of the distribution of mesoplankton during observations carried out in 1982. Materials studied were samples of zooplankton collected on the 11th cruise of the research vessel "Akademik L. Orbeli" in the fall of 1982 in a 30-liter reinforced polyethylene bathometer during the daylight hours in Burgas Bay, October and November. It was found that during the period of the study the plankton over most of the water area off the coast of Bulgaria was in a typical autumn state, with low biomass, small numbers of larvae of benthic animals and a number of summer neritic species. In terms of biomass, Oithona minuta, Acartia clausi and at some stations other animals dominated. In mid-November, Noctiluca miliaris became quite numerous along the coast. Only in the southern portion of the bay, due to constant eutrophication, are communities with rich development of phytoplankton and massive reproduction of Oithona developed in the autumn. Figures 3, tables 2; references 9: 5 Russian, 4 Western.  
[72-6508/12947]

## GEOMORPHOLOGY OF NORTHERN AND CENTRAL PARTS OF SHIRSHOV RIDGE (BERING SEA)

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85

(manuscript received 26 Jul 85; after revision 13 Jun 84) pp 809-812

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[Abstract] Echo soundings performed during the 29th cruise of the research vessel "Dmitriy Mendeleev" have provided new data on the relief of Shirshov Ridge. The ridge is subdivided into the northern, central and southern blocks. The author studied only the northern and central blocks, with a total length of 220 nautical miles, two-thirds the length of the entire ridge. Analysis of available materials revealed the following characteristic relief elements: the peak surface, slopes, foot, ridges, trenches, slope bends, terrace-like steps and scarps. A diagram illustrates the primary structures and depths and a map illustrates the area covered by the studies. The western slope is steep, broken and complicated with large ridges and trenches, sometimes of the graben type. The eastern slope is smoother, with some scarps and terraces; generally more gently sloping. A saddle, probably a large fracture, separates the ridge into the northern and central blocks, the southern block being 400-600 m lower than the remainder. Tectonic processes were responsible for the formation of the shape of the ridge. Figures 1, references 8: 6 Russian, 2 Western.

[72-6508/12947]

## HYDROCARBONS IN WATER AND SUSPENSIONS IN PACIFIC OCEAN AND BERING SEA

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85

(manuscript received 8 Jun 83; after revision 24 Sep 84) pp 761-767

NEMIROVSKAYA, I. A., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] On the 29th cruise of the "Dmitriy Mendeleev" in June-July 1982, organic compounds soluble in carbon tetrachloride or chloroform were analyzed in sea water and suspended matter from various depths. Data on the concentration of hydrocarbons in organic matter can be used to monitor ocean pollution and establish the background level of such compounds for future monitoring. The mild extraction conditions used were intended to maintain the organic matter in minimally altered condition. It is found that hydrocarbons entering the hydrosphere as a result of petroleum pollution or formed in sea water enter in the same transformation processes. In productive regions where large quantities of hydrocarbons are synthesized and may be formed in biochemical processes, their concentration may exceed the maximum admissible concentration

of 50 micrograms per liter. Combined biogeochemical studies are required to provide a reliable judgment concerning the degree of oil pollution of sea water and trace the dynamics of pollution. Figures 1, tables 2; references 12: 7 Russian, 5 Western.  
[72-6508/12947]

UDC 553.21(262.5)

#### FORMATION OF TODOROKITE AND BERNESITE IN Fe-Mn NODULES OF THE BLACK SEA

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA in Russian No 7, Jul 85 (manuscript received 28 Mar 84) pp 94-98

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[Abstract] Previous studies have concluded that compact Fe-Mn nodules from lakes and oceans are formed by similar mechanisms due to the similarity of their lithologic and geochemical composition. Direct microbiological observation of marine nodules have not been undertaken until now. To fill this gap, a study was made to determine the intensity of microbiological reduction processes in the neighborhood of Kalamitskiy Bay of the Black Sea where researchers have reported that Fe-Mn nodules are formed most extensively. In the Black Sea nodules, iron always predominates over manganese, being present in oxidized form. Specimens of bottom deposits containing Fe-Mn nodules were collected by bottom dredge at two locations in Kalamitskiy Bay in 1982 from the research vessel "Akademik Orbeli." The microbiological data indicated intensive processes occurring in the nodules themselves, forcing the authors to analyze specifics of their structure in order to find microzones in which anaerobic microorganisms could function. When nodules were fractured, small light gray clay inclusions, primarily hydromica, were found. The formation of minerals containing  $Mn^{2+}$  in the internal portions of Black Sea Fe-Mn nodules is thought to result from diagenetic transformation of raw materials occurring with the direct participation of various microorganisms. Figures 4, tables 1; references 11: 10 Russian, 1 Western.  
[39-6508/12947]

LOWER MIOCENE DIATOMS OF THE TROPICAL WEST PACIFIC

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA in Russian  
No 7, Jul 85 (manuscript received 8 Jun 84) pp 62-73

RADIONOVA, E. P., Geology Institute, USSR Academy of Sciences, Moscow

[Abstract] This survey of the (mostly American) literature discusses Lower Miocene diatoms of the tropical western Pacific. It is noted that by the beginning of the Middle Miocene the composition of diatomaceous flora was similar to the present composition, indicating that the Late Oligocene--Early Miocene stage was the time of appearance of those genera of diatoms most actively developed in the Neogene. Zones of Lower and Middle Miocene diatom complexes are associated with specific geological periods. The most important event in the development of diatoms in the first half of the Early Miocene was the evolutionary development of the genus *Actinocyclus*. In the second half of the Early Miocene the number of representatives of this genus was significantly reduced, the complex being dominated by the genus *Cestodiscus*. In the Upper Early and Lower Middle Miocene, monotypical genera developed with short intervals of dominance. By the bottom of the Middle Miocene, *Coscinodiscus pseudoincertus* and *C. blysmos* were widespread. Climatic fluctuations doubtless influenced the sequence of the species. Evolutionary and climatic changes of diatoms are common for the tropical Pacific. Figures 3, tables 1; references 26: 4 Russian, 22 Western.  
[39-6508/12947]

UDC 552.32(262.5)

AMPHIBOLITES OF SHIRSHOV RIDGE (BERING SEA)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA in Russian No 7,  
Jul 85 (manuscript received 10 May 84) pp 9-27

YURKOVA, R. M., PEYVE, A. A., ZINKEVICH, V. P. and CHERKASHIN, V. I.,  
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[Abstract] The 29th cruise of the research vessel "Dmitriy Mendeleev" in the summer of 1982 undertook a combined geological and geographic study of Shirshov Ridge at the juncture of the Aleutian and Komandorskiy trenches in the Bering Sea, an area previously little studied. This article discusses amphibolites and related rock formations brought up by dredging from the vessel. The mineralogy, petrochemistry and geochemistry of the rocks are discussed. The conditions of formation of the samples found are analyzed. The data on the nature and conditions of formation of metamorphic rock on the Bering Sea floor reveal the major stages of metamorphism and their significance in the tectonic development of Shirshov Ridge. In the western Bering Sea at the end of the Early Cretaceous and beginning of the Late Cretaceous, the

formation of the oceanic crust and emergence of tholeiitic basalts began. In the Late Cretaceous and Early Paleogene this region was separated from the remaining portion of the Pacific due to the onset of formation of the Aleutian Island system. In the east, destruction of the previously existing crust was compensated by the development of the Shirshov folded zone; in the west and northwest, ocean formations were thrust over the continental margin. Local dilatational processes later resulted in the appearance of subhorizontal tectonic discontinuities both in the crust and at its boundary with the mantle. The most probable mechanism explaining the formation of the amphibolites is disperse spreading in the western Bering Sea with subsequent movement to the east within the Shirshov folded zone. The specific mechanism of this spreading is not presently known. Figures 5, tables 6; references 36: 22 Russian, 14 Western.  
[39-6508/12947]

UDC 551.46:551.24

#### FORMATION CATEGORIES OF OCEANS AND SEAS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA in Russian No 7, Jul 85 (manuscript received 8 Jan 85) pp 3-8

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[Abstract] The article focuses on the fact that the ocean basins differ significantly in their dimensions, from which follow many differences in their geological properties, particularly formational composition. Four major categories of ocean basins are distinguished: small basins, mesobasins, megabasins and superbasins. Each of these categories is interpreted briefly. There is but one superbasin, the Pacific Ocean. The Atlantic and Indian Oceans are megabasins, as was the Kazakhstan-Siberian Ocean which existed some 600 million years ago. Mesobasins are distinguished from megabasins in that they are smaller and simpler in structure. The Eurasian basin in the Arctic is a present example, the Turkestan Paleozoic ocean is an example from the past. Small ocean basins are sometimes referred to as marginal seas, but this is incorrect. Several examples of ancient small ocean basins are listed. Tables 1; references 15: 13 Russian, 2 Western.  
[39-6508/12947]

NATURE OF GRAVITY ANOMALIES IN KURIL-KAMCHATKA ARC-TRENCH-OCEAN SYSTEM,  
EXEMPLIFIED IN SOUTHERN KURIL ARC

Novosibirsk TIKHOOKEANSKAYA GEOLOGIYA in Russian No 4, Jul-Aug 85  
(manuscript received 22 Feb 85) pp 113-117

POBEREZHNYI, V. D., SENACHIN, V. N., SUSHEKOV, Yu. A. and KOSYGIN, V. Yu.,  
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USSR Academy of Sciences, Novoaleksandrovsk

[Abstract] The author characterizes the determination of the nature of tectonic dislocations which have generated and which maintain isostatic anomalies as tectonic interpretation of the gravity field. Observed gravity anomalies are the result of the tectonic life in a region. More detailed information now available on the gravity field of the Southern Kuril portion of the Kuril-Kamchatka arc-trench-ocean system, obtained aboard the research vessel "Pegas" in 1976-1977, have allowed interpretation of observed anomalies at a qualitatively new level. The interpretations were based on free-air anomalies. Large positive and negative free-air anomalies indicate significant disruption of the isostatic state of the crust in the region studied, where the continent and ocean lithosphere blocks are joined. The observed gravity anomalies result primarily from the major morphostructural arc-trench system. Gravity anomalies in the arc-trench system cannot be considered separately from the geodynamic situation of the region. Calculations based on deep seismic soundings have shown that the nature of the gravity field is attributable primarily to the anti-isostatic model of the deep structure of the arc-trench system. Figures 2; references 26: 23 Russian, 3 Western.  
[67-6508/12947]

DYNAMICS OF CONTEMPORARY SEDIMENTATION AND HISTORY OF DEVELOPMENT OF GREAT  
GAMOV CANYON (SEA OF JAPAN) BASED ON UNDERWATER OBSERVATIONS

Novosibirsk TIKHOOKEANSKAYA GEOLOGIYA in Russian No 4, Jul-Aug 85  
(manuscript received 26 Nov 83) pp 13-18

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[Abstract] Results are presented from studies of Gamov Canyon performed from an underwater habitat in 1979 and 1982, studying the morphology, lithodynamic processes, stratigraphy and conditions of deposition of Late Cenozoic deposits. The main bed of the canyon begins at depths of 90-95 m as a valley a few meters deep and some tens of meters in width with gently sloping sides. At about 250-300 m, the canyon bed takes on a U-shaped cross-section with a flat



bottom up to 150 m wide with mean side slopes of about 5 degrees. The canyon and its tributaries are cut into sedimentary Neogene-Quaternary deposits. There are two levels of Pleistocene formations. Several major periods of formation of the canyon can be distinguished on the basis of morphological features, lithology and stratigraphic position and the nature of contemporary lithodynamic processes. The sedimentary mass in which the canyon is cut was formed in the Miocene. The major valley of the canyon and its lateral tributaries were formed in the Pliocene and Early to Middle Pleistocene. Partial filling of the upper part of the canyon occurred during a regressive period of the Late Pleistocene. Figures 3; references: 7 Russian. [67-6508/12947]

UDC 551.1:550.834.32(265)

#### CRUSTAL MODELS FOR VARIOUS PACIFIC OCEAN BED STRUCTURES

Novosibirsk TIKHOOKEANSKAYA GEOLOGIYA in Russian No 4, Jul-Aug 85  
(manuscript received 19 Aug 83) pp 3-12

SEMENOVA, G. I., Earth Physics Institute, USSR Academy of Sciences, Moscow

[Abstract] A comparison of seismic data in order to study lateral heterogeneities in crustal structure is possible only using the major parameters revealed by a variety of field methods and various interpretation approaches. This article summarizes deep seismic sounding data from the Pacific Ocean crust and suggests a plan for regionalization of the crust reflecting the major features of its lateral heterogeneity. In the process of summarizing the seismic materials, histograms of values of crustal parameters of individual geomorphological structures were first constructed, then groups of structures were studied with similar distributions of parameters. The regionalization map, together with models of the crust in the areas in question, reflects the essential lateral heterogeneity of the Pacific Ocean floor crust and represents a three-dimensional model at the present level of understanding. Figures 2, tables 2; references 34: 24 Russian, 10 Western. [67-6508/12947]

# PROBABLE INFLUENCE OF KUROSHIO CURRENT ON DISTRIBUTION OF RADIOLARIAN SHELLS IN BOTTOM DEPOSITS

Novosibirsk TIKHOOKEANSKAYA GEOLOGIYA in Russian No 4, Jul-Aug 85  
(manuscript received 21 Jul 83) pp 104-107

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[Abstract] This article describes the first results of studies of possible displacement of radiolarian shell associations relative to the locations where the radiolarians lived. The purpose of the study was to demonstrate mathematically conditions under which transfer and deposition of radiolarian shells would be possible. The weight and dimensions of the shells and water velocity at various depths were considered. The equations indicate that radiolarian shells could drift 500-2500 km, which could explain finding of tropical species in sediments in subtropical and boreal areas. The slopes of underwater elevations and island arcs, as well as deep-water depressions, might serve as traps for radiolarian shells. Earlier reports have stated that the families Actinommidae, Phacodiscidae, Lithelidae, and Sethphormididae live in the aphotic layer and would thus experience the least influence of ocean currents. The families Pterocorythidae, Cannobotryidae, Arthostrobiidae and Sphaerzoidae live near the surface and thus might be carried considerable distances. Figures 3; references 6: 4 Russian, 2 Western.  
[67-6508/12947]

# DETERMINATION OF THICKNESS OF MARINE SANDY SEDIMENT WAVE AGITATION LAYER BY STATIC SOUNDINGS

Moscow IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA in Russian No 9, Sep 85 pp 39-43

BOGDANOV, N. A. and KADIK, F. A., All-Union Scientific Research and Production Institute for Mining of Nonferrous Metals

[Abstract] A study was made to determine the distribution of thickness of the layer in which wave action affects marine sediment on the basis of an analysis bottom relief elements under the influence of storms of various force, for subsequent development of a technology for mining of minerals from this type of marine placer deposit. The bottom of the wave action zone is marked by a sharp change in sediment density, sorting factor, content of smaller fractions and quantity of larger fractions. The static soundings method is sensitive to changes in all these characteristics. Studies were made on a placer in the Baltic along a slightly concave arc in the coast oriented north-south. Work was done in the summer and fall, during calm weather in summer and stormy

weather in the fall. Analysis of the results indicated that the maximum frontal resistance to a sounding probe decreases with increasing distance from the beach into the sea. Particle-size distribution analysis indicated that all deposits studied were homogeneous, consisting of fine, pulverized sand. Generalized graphs were constructed on the basis of variations in sounding resistance showing that the greatest thickness and density of wave zone deposits are observed at the heads of scallops on the underwater slope, the least on their slopes. The thickness of the wave-disturbed zone decreases seaward from the area where the waves break, increasing with increasing wave action. Figures 2; references: 14 Russian.  
[33-6508/12947]

UDC 551.7:550.834

#### SEDIMENTATION BODIES OF SOMALIAN ABYSSAL TRENCH BASED ON SEISMOSTRATIGRAPHIC ANALYSIS OF GEOPHYSICAL AND DEEP DRILLING DATA

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA  
in Russian No 9, Sep 85 pp 3-8

SHLEZINGER, A. Ye. and SHTERENBERG, L. Ye., Geology Institute, USSR Academy of Sciences

[Abstract] In 1980 some 2,736 km of regional seismic profiles were correlated with deep drilling locations. The resulting materials made it possible to discriminate various types of sedimentation bodies and the isolation from tectonic slopes. The surface of the acoustic basement is characterized by intensive low-frequency reflections. The thickness of the sedimentary cover in the trench is up to 2.5-2.8 km, with practically horizontal bedding of strata. In the southeastern part of the trench the acoustic basement is at 7.5-8 km depth, the thickness of horizontal sedimentary layers up to 1.3 km. In the northwestern part of the trench the sedimentary cover is practically horizontal. The lower layers vary in thickness and level the structural relief of the surface of the acoustic basement. The sedimentary cover appears to consist of deposits of the same type throughout the trench. The major clay mineral is montmorillonite. Analysis of the mineralogical composition indicates that the deposits are primarily dark non-calcareous clays with almost no sand or silt deposits. The bedding conditions of geological bodies in the trench and their mineralogical composition indicate that they were formed exclusively during lateral displacements of primarily terrigenous sediments over the bottom of the basin. The source of the sediments was the African continent. Analysis of seismic sections in the trench and neighboring regions of the Arabian-Indian mid-oceanic ridge indicated predominance of lateral-gravitational and hydrogenous origins. References 7: 3 Russian, 4 Western.  
[33-6508/12947]

DETERMINATION OF EFFECTIVE VISCOSITY IN FINITE-DIMENSIONAL CASCADE TURBULENCE MODELS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 21, No 9, Sep 85 (manuscript received 14 Mar 84) pp 899-906

GLEDZER, Ye. B. and MAKAROV, A. L., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] An approximate study of multistage systems modeling 2-dimensional and 3-dimensional turbulence is undertaken, making it possible to determine the coefficients of effective viscosity corresponding to a finite number of elements in chains under conditions of energy and enstrophy transfer. Relaxation times are obtained corresponding to the current concepts of relaxation models. These plus the friction coefficients determined can be used to study multistage systems with small numbers of elements. Values are obtained analogous to the attached mass coefficients for subsequent levels of the system. References: 10 Russian, 1 Western.  
[70-6508/12947]

STRUCTURE AND MINERALOGICAL COMPOSITION OF DEEP-WATER TROPICAL ATLANTIC CORALS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 85 (manuscript received 25 Feb 85) pp 20-23

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[Abstract] Fragments of living and dead coral were brought up during the 28th cruise of the research vessel "Akademik Vernadskiy" on the north slope of the Romanche Depression. The corals were Leptogorgia sp. and Isis sp., coral polyps, subclass of 8-ray corals. Coral skeletons as they grow accumulate information on the ecological and hydrochemical changes in the environment. The substance of the corals was studied by microscopic, thermographic, radiographic, gasometric, chemical and spectral methods. The data obtained indicate that the elements Mn, Ni, Co, Cu, Ag and Zn were collected by the living coral from the surrounding environment, while Ti, Cr and Sr were incorporated in the structural lattice. In the deceased coral, Ni, Cr, Cu, Ag and Zn were sorbed, while the structural lattice contained Mn, Co, Ti, V, Pb and Sr. In coral covered with a ferromanganese crust, the elements Cr, Ag and Zn are sorbed; the others are part of the structure of the coral, due to long-term soaking of the skeleton in solutions of these elements. The substance of the corals consists 95.5-98% of calcium carbonate. Impurities, representing 2.0-4.5%, consist primarily of  $Fe_2O_3$ ,  $P_2O_5$  and MnO, as well as

NiO and CoO. Trace elements include several phases sorbed onto the surface, included in the living matter of the corals and firmly attached to the structure of the coral skeleton. Figures 1; references: 5 Russian.  
[62-6508/12947]

UDC 622.24.085.5

#### METHOD FOR DETERMINING TECHNICAL PARAMETERS OF HYDRAULIC IMPACT DRIVE FOR UNDERWATER DRILLING

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA in Russian No 8, Aug 85 pp 112-116

SHELKOVNIKOV, I. G., KIPOVSKIY, V. Ya. and KOCHETOV, S. O., Leningrad Mining Institute

[Abstract] Hydraulic impactors designed by the "Soyuzgeotekhnika" Association and a hydraulic vibrator for the PUVV-150 sample collector designed by the Donetsk Polytechnic Institute have been successfully used to drill boreholes and take samples from the sea bottom at shallow depths. Theoretical principles have been developed for valve machines of this type. This article, calculates the technical parameters of a drive for stipulated bottom material characteristics, sample diameter and desired sample length. The mass of the striker, ratio of its length to diameter, speed of impact on the anvil, drive power, speed and depth of penetration of the soil pump, mass and dimensions of the drive are determined relative to stipulated bottom material hardness. By using the equations presented in this article, taking into account the geological conditions of the bottom, energy source machine design, one can calculate the major parameters of an impact-type hydraulic drive for any specific case. Figures 3; references: 2 Russian.  
[32-6508/12947]

UDC 551.24

#### PRINCIPLES OF TECTONIC REGIONALIZATION AND DESCRIPTION OF STRUCTURAL ELEMENTS ON TECTONIC MAPS OF WATER AREA

Moscow GEOTEKTONIKA in Russian No 5, Sep-Oct 85 (manuscript received 24 May 83) pp 14-18

KOSYGIN, Yu. A. and KULYNDYSHEV, V. A., Tectonics and Geophysics Institute, Far Eastern Scientific Center, USSR Academy of Sciences

[Abstract] Any tectonic map should utilize the same principle of tectonic regionalization throughout the map. This article examines the tectonic regionalization principle and describes structural elements for several types of land-water maps, including a land-shelf area, ocean floor and land-ocean

floor area. In constructing tectonic maps, including for the ocean floor, problems of joining models of different specializations are particularly significant. Examples of maps successfully achieving this are mentioned, but not illustrated. References 21: 18 Russian, 3 Western.  
[57-6508/12947]

UDC 551.242.23(261.264)

#### NEW DATA ON DEEP STRUCTURE OF MID-ATLANTIC RIDGE AT 20°S

Moscow GEOTEKTONIKA in Russian No 5, Sep-Oct 85 (manuscript received 17 Jan 85) pp 5-13

PUSHCHAROVSKIY, Yu. M., YELYNIKOV, I. N. and PERFILYEV, A. S., Geology Institute, USSR Academy of Sciences; Oceanology Institute, Southern Division, Gelendzhik

[Abstract] Results are presented from processing and interpretation of data on deep multichannel seismic profiling by the reflected waves method over the Mid-Atlantic ridge at 20°S during the seventh cruise of the research vessel "Professor Shtokman". Total profile length was 293 km. The materials were profiled at the computer center of the "Yuzhmorgeologiya" Association, USSR Ministry of Geology, at Gelendzhik. The deep structure of the ridge is similar to the structure of the ridge in other areas, with significant differences. Volcanic cones with lava flows are clearly visible on the ridge slopes. Differences from other sections are discussed and two segments of the seismic profile are presented. The most clearly seen specific feature of the profile consists of zones of hard-plate deformations superimposed on the structure of the third layer in the central and partially in the western segments of the profile. These structures clearly dip to the east and remain within the third layer. The structures may have developed in the process of folding of the third layer of the oceanic crust beneath the axial zone of the ridge, but their genesis cannot be precisely determined at present. Figures 2; references 24: 15 Russian, 9 Western.  
[57-6508/12947]

## SPECIFICS OF DEVELOPMENT OF SPREADING ZONES IN CONTEMPORARY AND PALEOCEANIC STRUCTURES

Moscow GEOTEKTONIKA in Russian No 5, Sep-Oct 85 (manuscript received 20 Jan 84) pp 19-33

PERFILYEV, A. S., KOPTEVA, V. V. and KURENKOV, S. A., Geology Institute, USSR Academy of Sciences

[Abstract] Three features were selected for study of the second layer by direct geological methods: Iceland, the southern Urals, and the Bayan--Khongorskaya zone in Mongolia. The spreading process is found on the basis of these three areas to have certain peculiarities best seen by detailed study of "dike in dike" complexes. The peculiarities found to be common throughout the world and throughout geological history include jumping of magma segregation axis, flank magmatism and a shear component in dilatation. A model of formation of the oceanic crust in spreading zones is proposed. Such phenomena as the shear component, segregation and jumping during spreading are widely found in global structures. All of these peculiarities indicate some common mechanism responsible for their occurrence. A hypothetical model attempts to explain these characteristics. According to the model, at a certain moment "A" the zone of an ascending flow of a hypothetical substance is located directly beneath a spreading rift zone in an upper plate of the lithosphere, forming a magma hearth, producing a "dike in dike" complex. At the next moment the lower mantle plate continues to spread, more or less symmetrically, producing a newly formed mantle plate. The overlying crustal plate shifts relative to the mantle so that the rift is on the flank of the mantle diapir. Finally, the crustal plate shifts with respect to the mantle plate so that the previous spreading axis is beyond the current spreading axis and the magma generation zone is in the mantle plate, causing breaking of the crustal plate and formation of a new spreading axis. Figures 7; references 33: 19 Russian, 14 Western.

[57-6508/12947]

## DEEP MAGNETIC DIAPIRISM OF CUBA AND ITS STRUCTURAL SIGNIFICANCE. PART 1

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 7, No 5, Sep-Oct 85 (manuscript received 20 Nov 84) pp 82-93

BOVENKO, V. G., OROVETSKIY, Yu. P., and SHCHERBAKOVA, B. Ye., Geophysics Institute, Ukrainian Academy of Sciences, Kiev; All-Union Geophysics Scientific Research Institute, USSR Ministry of Geology, Moscow

[Abstract] Experimental data were summarized by reinterpretation of previously published materials, consisting primarily of detection in the territory of Cuba of transcrustal acoustical anomalies by statistical filtration. This technique significantly increases the formation content of reflected wave studies in this area. Anomalies are identified with deep magmatic diapirs, primarily of ultrabasic composition. Studies of thirteen profiles throughout the island indicate that the most ancient discontinuities separate the deep magmatic diapirs (anticlinoria) from synclinal structures. It is concluded that for a long period of time, beginning in the late Cretaceous, events occurred in the region of the modern Caribbean Sea related to active settling, causing Tertiary block tectogenesis in the territory of Cuba. Figures 2; references 37: 36 Russian, 1 Western.  
[58-6508/12947]

## DENSITY MODEL OF INDIAN OCEAN MANTLE

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 7, No 5, Sep-Oct 85 (manuscript received 28 Sep 84) pp 61-69

RUSAKOV, O. M., Geophysics Institute, Ukrainian Academy of Sciences, Kiev

[Abstract] The reliability of interpretation of seismic and gravimetric observations in studying crustal structure in the Indian Ocean depends to a great extent on the reliability of separation of the component resulting from global anomalies from the total field. The ambiguity of separation of anomalies can be decreased by the use of quantitative parameters of density heterogeneities on a global scale. As a result of expansion of some 700,000 values of travel-time anomalies in spherical functions, it was possible to determine deviations in seismic wave velocity from a spherically symmetric distribution down to the core-mantle boundary. The major features of the gravity field in the Indian Ocean and its neighborhood in the longest wavelength range were found to result from density heterogeneities in the mantle which are expressed as anomalies in the velocity field. Calculations have shown that the gravity field in the Indian Ocean obtained by expansion up to twelfth-order harmonics is the total gravitational effect of density heterogeneities located at various levels and varying within the limits of



each layer. The first three-dimensional seismogravitational model of the Indian Ocean mantle takes into account the sphericity of the earth and clearly indicates the interference nature of long-wave free-air anomalies in the area studied. The observed picture of changes in gravitational force result from the total gravitational effect of density heterogeneities of the entire mantle, rather than the influence of any single zone or boundary. A significant portion of the Indian minimum results from lateral variations in density in the 670-1,100 km layer. The density model is sensitive to changes in contours of the anomalous masses and the sign on the coefficient  $\Delta V/\Delta \rho$ , but is quite stable to fluctuations in  $\Delta V/\Delta \rho$  within the zone. The magnitude and scale of long-wave gravity anomalies in the Indian Ocean can be attributed to curvature of the surfaces of interfaces between phases under the influence of 2-scale convective flows carrying heat through the entire mantle. Figures 5; references 24: 9 Russian, 15 Western.  
[58-6508/12947]

UDC 551.465(261.3)

#### RELATIONSHIP OF DISTRIBUTION OF HYDROCHEMICAL CHARACTERISTICS TO STRUCTURE AND DYNAMICS OF BALTIC SEA WATERS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA in Russian No 21, Issue 3, Sep 85 (manuscript received 15 Mar 85) pp 115-119

KAZARYAN, V. V., KOROVIN, V. P. and OSIPOV, N. N.

[Abstract] Expeditionary investigations in July-August 1984 studied the relationship among the basic hydrologic and hydrochemical characteristics of water masses in the Baltic Sea in order to determine the possibility of using them as indirect indications of water mass dynamics in the sea. Four standard hydrologic sections were run during the expedition. Data on hydrologic characteristics in the four cross-sections indicate that the hydrochemical characteristics (particularly oxygen) are suitable as indirect indicators of the dynamics and structure of Baltic Sea water masses. This is particularly true of the open regions of the sea, where the influence of biological and biochemical processes is slight. In shallow, well-heated regions the hydrochemical characteristics lose their significance as indicators of water dynamics and structure. In open portions of the sea, oxygen can apparently serve even as a unique characteristic describing the structure of the water masses. Figures 2; references: 3 Russian.  
[75-6508/12947]

MONSOON VARIABILITY OF THERMOHALINE FIELDS AND CIRCULATION OF WATERS IN MAIN  
PYCNOCLINE IN NORTHWESTERN INDIAN OCEAN

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA  
in Russian No 21, Issue 3, Sep 85 (manuscript received 18 Mar 85) pp 111-114

KLEPIKOV, V. V. and LOKHITAKSHAN KHARENDU PRAKASH

[Abstract] A study is made of seasonal variability in the water layer of the main pycnocline at 200-800 m depth based on nonaveraged data from deep water oceanographic observations of various expeditions between 1959 and 1977. The depth of isopycnic surfaces changes from season to season. The temperature and salinity of these surfaces are traced. It is concluded that waters in the northwestern Indian Ocean react to the monsoons in the atmosphere down to a depth of 700-800 m and probably deeper. The salinity distribution changes most greatly at isopycnic surfaces corresponding to the core of the intermediate water masses, indicating variability of advection of water from the Persian Gulf and Red Sea, particularly in winter. Figures 2; references 14: 9 Russian, 5 Western.  
[75-6508/12947]

GEOCHEMICAL CHARACTERISTICS OF AUTHIGENIC IRON SULFIDES IN BLACK AND CASPIAN  
SEAS

Kiev GEOLOGICHESKIY ZHURNAL in Russian Vol 45, No 5, Sep-Oct 85  
(manuscript received 30 Sep 83) pp 116-124

VOLKOVA, T. V. and MITROPOLSKIY, A. Yu., Odessa University imeni I. I.  
Mechnikov, Odessa; Geological Sciences Institute, Ukrainian Academy of  
Sciences, Kiev

[Abstract] The study of authigenic iron sulfides in upper Quaternary deposits in the Black and Caspian Seas is doubtlessly significant for determination of the metallogeny of bottom deposits. Since natural sulfides usually contain microscopic impurities whose concentrations depend on conditions of formation and crystallo-chemical specifics of the sulfides, comparison of the complex of microimpurities can be used to determine differences and similarities of composition as functions of formation conditions. Therefore, particular attention is given in this work to the study of the structure and microimpurity composition of iron sulfides. Phase composition was studied by x-ray structural analysis. The microimpurity composition of similar fractions was studied by approximate quantitative spectral analysis. The comparative analysis of microimpurity distribution indicated that Mn, Cu, As, Ni, Co, Mo and Pb are constant microimpurities in both areas. Significant differences were found in the content of these impurities in the Black Sea and Caspian

Sea bottom sediments. Authigenic iron sulfides from Black Sea deposits have the following sequence of elements:

Mn>As>Cu>Ni>Pb>Co>Mo.

In Caspian sediments, the comparable sequence is As>Cu>Mn>Ni>Co>Pb>Mo. In the Black Sea there is a tendency toward lower content of Mn, Cu and As with increasing depth. In the Caspian Sea, the content of Cu, As and Pb varies over a wide range, independently of depth. Iron sulfides from the Black Sea show an Ni/Co ratio of less than 1, indicating sedimentary-diagenetic origin of the sulfides. In the Caspian Sea, Ni/Co = ~2.5, indicating an additional influx of metallic materials in the sediment. Figures 5, tables 1; references: 18 Russian.

[56-6508/12947]

UDC 550.361

#### HEAT FLOW THROUGH BOTTOM IN WESTERN BLACK SEA

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 8, Aug 85 (manuscript received 19 Jun 84) pp 113-123

DUCHKOV, A. D. and KAZANTSEV, S. A., Geology and Geophysics Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] Results are presented from geothermal studies in the western Black Sea on board the research vessel "Yevpatoriya" in 1981-1983, as well as data from the literature. The geothermal operations included measurement of the temperature of bottom silt, geothermal gradient in the silt, heat conductivity coefficient of the sediment and calculated heat flow through the bottom. The results have significantly improved knowledge of the distribution of the heat flow in the western Black Sea. In addition to 95 previous determinations, some 120 additional ones have been added by the recent cruises. For the first time, the distribution of bottom sediment temperature has been studied over a broad area and large-scale measurement of heat conductivity of bottom silts has been undertaken (over 1,000 determinations). The heat conductivity coefficient was found to vary with moisture content of the sediment. The temperature field of bottom sediment was found to be unsteady down to 400-500 m depth, apparently related to the influence of wind-wave mixing, currents, sediment movement and climatic fluctuations in water temperature. A great area of low heat flow is defined, related to the cooling influence of sediment accumulation in the Pliocene-Quaternary time within the alluvial fan of the ancient Danube. Available materials suggest a comparative homogeneity of heat flow in the western Black Sea of 50-60 mW/m<sup>2</sup> after allowing for sediment accumulation, agreeing with the heat flow of surrounding continental areas. Figures 5, tables 1; references 23: 19 Russian, 4 Western.

[54-6508/12947]

## HYDROCARBON GAS-HYDRATE FORMATION BENEATH BOTTOM OF SEAS AND OCEANS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 4, Oct 85  
(manuscript received 25 Dec 84) pp 976-978

TROTSYUK, V. Ya., NEMIROVSKAYA, I. A., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] The predictions of the early 1970's that there might be zones of hydrocarbon gas-hydrate formation beneath the ocean floor, a new type of nontraditional fuel-energy resource for the planet, have been confirmed. Data from recent marine expeditions by the authors are presented, indicating that formation of these zones in the ocean is controlled by thermodynamic factors and genetic factors, i.e., the scale of the gas generation processes. The authors' institute undertook gasometric and biogeochemical measurements using sealed sampling devices and high-precision express analyzers as a part of the "Akvanefit" project on the 29th cruise of the "Dmitriy Mendeleev" in 1982 around the northern rim of the Pacific Ocean in an area selected to determine the nature of hydrocarbon gas saturation of bottom sediments. It is concluded that components migrate into the bottom environment over a focal area, bringing in additional nutrient matter and energy and stimulating the vital activity of microorganisms and resulting in biogenic concentration of organic matter, including hydrocarbon gases. The increase in gas content in deep intervals of sediment columns indicates that in deeper sedimentary horizons under the necessary conditions of temperature and pressure, saturation of polar water with hydrocarbons could occur, creating the genetic conditions for development of gas formation zones. Figures 3; references 7: 4 Russian, 3 Western.  
[66-6508/12947]

UDC 550.4.42:551.464.6

## CONCENTRATION OF ELEMENTS IN OCEAN AS GEOCHEMICAL FACTOR

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 4, Oct 85  
(manuscript received 4 Mar 85) pp 827-830

KORZH, V. D., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] Results of studies of the content of 53 chemical elements in ocean and river water, determined separately in suspended and dissolved forms, have been published by previous authors. This extensive new material was used by the authors of this article to study the mutual influence of chemical composition of river and ocean water. The elements are graphed in coordinates of  $-2 \log (C_A/C_{C1})_{\text{ocean}}$  vs.  $\log (C_A/C_{C1})_{\text{river}}$ , in which

coordinates they occupy a strictly limited space enclosed between two straight lines converging at the zero point. The line dividing the angle formed by the coordinate axes in half is the geometric locus of points where the ratios of concentration of elements to concentration of chlorine coincide for sea water and river water. A geochemical model of the ocean is generated in graphic form, revealing the commonality of geochemical properties of elements and allowing their classification as conservative, biogenous and lithogenous. The classifications overlap, P, V and As being conservative biogenous elements, while Cr, Fe, Co, Ga, Sb, Ho, Er, Tm, Yb and Lu are biogenous and lithogenous. Figures 2; references 10: 6 Russian, 4 Western.  
[66-6508/12947]

UDC 532

#### EXAMPLE OF EQUIVALENCY OF DENSITY STRATIFICATION AND ROTATION EFFECTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 2, Sep 85  
(manuscript received 21 Mar 84) pp 310-313

VLADIMIROV, V. A., Hydrodynamics Institute imeni A. A. Lavrentyev, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] A study is made of a class of movement in a rotating fluid closest in its properties to the movement of a stratified fluid. Unstable motion of an incompressible homogeneous ideal fluid is studied in a system of coordinates rotating at a constant rate. The greatest limitation on the analogy between the effects of density stratification and rotation is the difference in the effect of rotation on different movements. This limitation also occurs in other situations, particularly in the problem of stability of flows with helical and circular streamlines. The presence of viscosity is generally speaking a limitation to fruitful application of this analogy. This limitation does not exist, however, in the stability problem. Figures 1; references 14: 7 Russian, 7 Western.  
[37-6508/12947]

## GEOLOGY OF SAN VICENTE ISLAND (CAPE VERDE ARCHIPELAGO)

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 2, Sep 85  
(manuscript received 21 Nov 84) pp 419-423

AKHMETYEV, M. A., KOPORULIN, V. I., MAZAROVICH, A. O., RIKHTER, A. V. and FRIKH-KHAR, D. I., Geology Institute, USSR Academy of Sciences; Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry Institute, USSR Academy of Sciences, Moscow

[Abstract] Geological studies were performed in early 1984 by a Soviet team under the leadership of Yu. M. Pushcharovskiy. Geological mapping indicated that San Vicente consists primarily of magmatic rock, the most ancient formations being crystalline rock in the central and northwest portions. Most of San Vicente consists of effusive and pyroclastic formations. This article describes the formations, concluding that the structure of the island was formed in five main phases of island development. During the initial phase, alkaline-ultrabasic magmas intruded, apparently into Jurassic-Cretaceous deposits, producing the first island uplift. During the second and third phases, subaqueous effusive-pyroclastic formations were accumulated. The fourth phase is associated with tectonic-magmatic activation of the region, the formation of fractures, introduction of subvolcanic phonolite and carbonatite bodies, formation of the contemporary relief and discharge of picrite basalts. During the contemporary, fifth phase the volcanic apparatus is forming in the eastern and northeastern portions of the island. Figures 2; references: 2 Western.  
[37-6508/12947]

UDC 548.32:539.17

## NEW MINERAL VARIETIES OF HYDROTALCITE-MANASOCITE GROUP--PRODUCTS OF LOW-TEMPERATURE CONVERSION OF BASALTS AND VOLCANOGENIC-SEDIMENTARY ROCKS ON OCEAN FLOOR

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 2, Sep 85  
(manuscript received 20 Dec 84) pp 443-447

DRITS, V. A., LISITSYNA, N. A. and CHERKASHIN, V. I., Geology Institute, USSR Academy of Sciences, Moscow

[Abstract] This work established for the first time the broad distribution of a group of minerals, the basic structure of which consists of brusite-like layers among products of secondary alteration of basalts and surrounding rock. The minerals are represented by a large group of varieties having unique structural and crystallochemical characteristics. Some of these have not been previously described. The minerals are found in volcanic--sedimentary masses deposited on basalts of the underwater volcanos Atlantis, Ampere and

Josephine in the North Atlantic. Materials for this study were collected during the fourth cruise of the research vessel "Akademik Mstislav Keldysh." A volcanogenic sedimentary mass of Miocene-Quaternary age 50 - 1500 m thick was sampled, consisting of pebble and boulder conglomerates and sandstones with variously altered basalts in a calcareous cementing mass. Ordered mixed stratified formations were found among the varieties studied, the structure of which alternately contained sulfate and carbonate-containing gaps between strata. A detailed description of the composition and structure of the volcanogenic-sedimentary rocks is promised for a future publication. The specifics of localization of authigenic minerals lead to the conclusion that the initial material for secondary mineral formation consisted of altered basaltic fragments and hyaloclastites. The major factors determining the possibility of synthesis of hydrotalcite-like minerals are related to the high alkalinity of the medium, intensive removal of such elements as Mg and Al from the basalts, relatively closed nature of the system and mobilization of Mg,  $SO_4$  and  $CO_3$  from sea water. Figures 2, tables 1; references 12: 5 Russian, 7 Western.  
[37-6508/12947]

UDC 552.11:552.32

# MAGMATISM OF MAJOR OCEAN MORPHOSTRUCTURES AND CERTAIN GEODYNAMIC ASPECTS OF ITS MANIFESTATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 2, Sep 85  
(manuscript received 1 Mar 85) pp 473-477

SHARKOV, Ye. V. and TSVETKOV, A. A., Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry Institute, USSR Academy of Sciences, Moscow

[Abstract] The authors' institute has developed a special program allowing discrimination of magmatic series for various types of geodynamic situations by computer. There are six series in all. The tholeiite and lime-alkaline series are distinguished from subalkaline and alkaline series on a  $K_2O+Na_2O - SiO_2$  graph by the equations:  $K_2O+Na_2O = 0.3694 SiO_2 - 14.3917$  (where  $SiO_2 < 67\%$ ) and  $K_2O+Na_2O = 7.9205$  (where  $SiO_2 > 67\%$ ). The tholeiite and lime-alkaline series are separated on the  $FeO/MgO-SiO_2$  graph by the equation  $FeO^*/MgO = 0.1562 SiO_2 + 6.685$ . Alkaline and subalkaline series are separated on the basis of the absence in the former and presence in the latter of normative feldspar derivatives leucite and nepheline. The K-Na and K sequences of subalkaline and alkaline series are separated on the basis of the relationship of alkalis. The magmatic series developed in the ocean are analogous to magmatic series in continental rift areas and continental intraplate magmatism with the exception of the specific oceanic basalts in the axial portions of the mid-oceanic ridges and specific continental K-alkaline series. This indicates basic similarity of the matter of the upper mantle where melting foci are located under both continental and oceanic segments. References 10: 5 Russian, 5 Western.  
[37-6508/12947]

## NORTH ATLANTIC UPPER MANTLE HETEROGENEITIES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 9, Sep 85  
(manuscript received 5 Mar 84) pp 23-35

KUNIN, N. Ya., and USENKO, S. V., Earth Physics Institute, USSR Academy of Sciences

[Abstract] It is demonstrated that in much of the North Atlantic elastic wave boundary velocity values remain constant on profiles with differing orientation. Studies of the anisotropy of elastic wave boundary velocities are not useful in such areas. Regionalization of the North Atlantic based on these velocity values reveals three major areas differing in mean and modal velocities and distribution of velocities. It is found that heat flow, gravity anomalies and regional anomalies of the geoid correlate with these three areas, probably reflecting large lateral heterogeneities in the upper mantle, though they do not coincide with the continental margins or mid-oceanic ridge boundaries. The results are compared with regionalization of other geophysical parameters. The upper mantle of the North Atlantic and adjacent continental areas can be characterized by a single zonality, the areas distinguished in the homogeneous mantle generally continuing beyond the limits of the continents essentially unchanged. Figures 4, tables 1; references 36: 17 Russian, 19 Western.  
[60-6508/12947]

## GEOTHERMAL STUDIES IN CENTRAL INDIAN OCEAN BASIN

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 9, Sep 85  
(manuscript received 30 Jul 84) pp 110-112

VANYAN, L. L., GORODNITSKIY, A. M., PALSHIN, N. A. and SHILOVSKIY, P. P., Oceanology Institute, USSR Academy of Sciences

[Abstract] The 31st cruise of the research vessel "Dmitriy Mendeleev" undertook three measurements of heat flow near an anomalous zone extending in a northwesterly direction over Afanasiya Nikitina seamount from 80 to 88°E, an area in which heat flow density increases to 100-200 mW/m<sup>2</sup>, two to four times the background values. Two-dimensional numerical modeling with the finite elements method showed no significant distortions in the calculated heat flow density to the southwest of the anomalous zone. As concerns the northeastern margin, the tapering of the sedimentary cover near the extensive seamount creates heat flow density anomalies. However, due to the great thickness of bottom sediments, these anomalies are not great. Numerical modeling thus gives no reason to consider the increased heat flow values to be the result of distortions in contrast heat conductivity. The very high heat flow values density obtained in this region correspond to a geothermal



gradient of  $100^\circ$  per kilometer, which should result in melting at a depth of about 12-13 km if conductive heat transfer is predominant. Figures 1; references: 2 Russian.  
[60-6508/12947]

UDC 517.911

# SCATTERING MATRIX AND INTEGRABILITY OF CLASSICAL WAVE SYSTEMS WITH ADDITIONAL MOTION INTEGRAL

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, Aug 85  
(manuscript received 6 Dec 84) pp 1325-1328

ZAKHAROV, V. Ye., corresponding member, USSR Academy of Sciences, and SHULMAN, Ye. I., Theoretical Physics Institute imeni L. D. Landau, USSR Academy of Sciences, Chernogolovka, Moscow Oblast; Water Problems Institute, USSR Academy of Sciences, Moscow

[Abstract] Results are presented concerning Hamiltonian systems with an infinite number of degrees of freedom describing nonlinear waves from the physical standpoint. Classical wave systems in an infinite medium with translational symmetry and described in a  $k$ -space by a unique complex function are considered. The results obtained are easily extended to Hamiltonians of general form. If  $H_{int}$  does not contain terms cubic with respect to  $a_k(t)$ , decay processes are impossible and dispersion is always nondegenerate unless it is a homogeneous function of the first power. References 4: 1 Russian, 3 Western.  
[45-6508/12947]

UDC 577.3:534.2

# POSSIBILITIES OF ACOUSTIC THERMOGRAPHY OF BIOLOGICAL OBJECTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, Aug 85  
(manuscript received 5 Mar 85) pp 1495-1499

GULYAYEV, Yu. V., academician, GODIK, E. E., DEMENTIYENKO, V. V., PASECHNIK, V. I. and RUBTSOV, A. A., Radio Engineering and Electronics Institute, USSR Academy of Sciences, Moscow

[Abstract] A study is made of a new method of determining the spatial distribution of temperatures within the depth of a biological object, based on its thermal acoustic emission. Acoustic waves at 1 to 10 MHz pass easily through most biological materials and have a wavelength of but a few millimeters, meaning they have good spatial resolution. Quantitative estimates are given of the sensitivity and resolution of acoustic thermography, which are compared with the parameters of radio thermography. When a matrix receiver

is used, acoustic thermography has significant advantages for precise location of depth and boundaries of deep heat sources such as tumors, inflammation foci, etc. An additional advantage of acoustic thermography is the simplicity of technical implementation of multispectral probing, required to ascertain the distribution of temperature with depth. Figures 3; references 7: 3 Russian, 4 Western.

[45-6508/12947]

UDC 911.2:551.35+551.46

#### MARINE LANDSCAPE STUDIES: NEW APPROACH TO STUDY OF OCEAN ENVIRONMENT

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOGRAFICHESKAYA in Russian No 5, Sep-Oct 85 (manuscript received 8 Apr 85) pp 5-14

GERSHANOVICH, D. Ye. and FEDOROV, V. V., All-Union Marine Fisheries and Oceanography Scientific Research Institute

[Abstract] A brief review is presented of the application of landscape studies, well-developed on land, to the study of the characteristics of the ocean, particularly the ocean floor. A bottom landscape is a finite element in a system with unilateral flow of matter and energy. The significance of interaction between systems on the bottom and near the bottom has been determined to be quite great. The problem of studying ocean floor landscapes can be solved completely only by continued development and practical introduction of submarine technology. The capacity of humans to actually see the bottom with their own eyes is a necessary part of this technology. A diagram illustrates several types of underwater studies and the equipment utilized, including scuba, unmanned instrumented devices and manned submersibles. Figures 3; references 25: 24 Russian, 1 Western.

[74-6508/12947]

## TERRESTRIAL GEOPHYSICS

### ACTIVE KAMCHATKA VOLCANO STUDIED

Moscow TASS International Service in Russian 1318 GMT 14 Dec 85

[Article: "Tents by the River of Fire"]

[Text] Petropavlovsk-Kamchatskiy, 14 Dec (TASS). Soviet scientists have set up camp in tents near a fire-spitting lava flow on the side of one of the greatest active volcanoes in Eurasia, Klyuchevskiy, on the Kamchatka Peninsula (northeastern USSR). An expedition from the Volcanology Institute of the Far Eastern Scientific Center, USSR Academy of Sciences, will explore the consequences of the powerful explosions which took place at an elevation of  $2\frac{1}{2}$  km as a result of the interaction of ice and lava, thousands of degrees hot, which erupted from the crater's peak. The scientists from different disciplines--geologists, geochemists and geophysicists--will also study the nature and processes of the present volcanic eruption.

The expedition landing was preceded by a helicopter flight around the active volcano undertaken by a team of scientists. They recorded lava eruptions from the crater, which are sliding in three fiery flows along the slopes of the snow-covered volcano, causing mud flows. The ash and rock eruptions are reaching a height of 2 km. However, there is no threat to the town lying 30 km away from the eruption.

Every second the volcano, which arose roughly 8,000 years ago, is receiving about 2 metric tons of magma from the depths, said Professor Sergey Fedotov, director of the Institute of Volcanology. As a result of such an intensive upheaval of material to the surface, a mountain almost 5 km high has formed in that time. This is already the second eruption this year through the peak crater, although there are frequent eruptions through the side breaches on the slopes. According to the estimates made during the scientists' flight, ash alone is now being ejected at a rate faster than 10 metric tons a second, and lava is being ejected at no less than 50 metric tons a second.

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CSO: 1865/201-E

## SEISMIC PROSPECTING WITHOUT BLASTING TESTED

Moscow TASS in Russian 23 Dec 85

[Text] Tests of Seismokod units, developed by scientists in Kharkov (the Ukraine) for geological survey of the earth's depths without explosions, have been completed, MN INFORMATION writes. The unit, mounted on a motor vehicle, sends into the depths in accordance with a set schedule, a series of powerful mechanical pulses--200 in 10 seconds. The resultant seismic waves penetrate several kilometers deep and return to the surface. Sensitive instruments record them and transmit them to a computer. Having processed the data, the computer produces the characteristics of the geological section of the earth's layers and makes it possible to determine the sites for drilling prospecting holes.

/12947

CSO: 1865/201-E

UDC 550.83:550.814:551.24

# STRUCTURAL ELEMENTS ON KAMCHATKA REVEALED BY ANOMALOUS MAGNETIC FIELD

Novosibirsk TIKHOOKEANSKAYA GEOLOGIYA in Russian No 4, Jul-Aug 85  
(manuscript received 17 Jun 83) pp 26-33

ZIMIN, V. M., Kamchatgeologiya, Petropavlovsk-Kamchatskiy

[Abstract] A new interpretation of the anomalous magnetic field of Kamchatka has been made. The author analyzed a map of  $\Delta T_a$  isodynes compiled in 1970 and transformed to 1:200,000 scale. The result of the analysis is a structural diagram of regionalization of the  $\Delta T_a$  field, showing ten regions. The ten regions are described and a geological interpretation of the aeromagnetic data is presented for each. The major feature of the anomalous magnetic field is the northeast (Kuril-Kamchatka) strike of the anomalous regions, which agree with elements of the geological structure and structural plan of the peninsula. There is close correlation between  $\Delta T_a$  field elements and elements of the structural plan on the peninsula, with Paleogene formations of the island-arc stage of regional development playing an important role. The  $\Delta T_a$  field reflects circular structures of various ranks, the largest reaching 300 km in diameter. Figures 1; references: 5 Russian.  
[67-6508/12947]

UDC 550.837

# LAYERS OF INCREASED CONDUCTIVITY IN CRUST AND UPPER MANTLE BENEATH KAMCHATKA

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 9, Sep 85  
(manuscript received 21 Nov 84) pp 61-69

MOROZ, Yu. F., Volconology Institute, USSR Academy of Sciences

[Abstract] Analysis of magnetotelluric sounding data for Kamchatka indicate characteristic forms of longitudinal curves. These are grouped into sets corresponding to regions with different deep geoelectric cross-sections. The middle curves of the sets are combined into groups corresponding to large zones with various deep geoelectric cross-sections. Differences in deep geoelectric cross-section are reflected in the tectonics, magmatism, heat

field and hydrothermal activity. The deep geoelectric model of Kamchatka proposed summarizes the electromagnetic research done in the area. Geoelectric and geothermal cross-sections of the area are presented. Figures 5; references 15: 14 Russian, 1 Western.  
[60-6508/12947]

UDC 551.596.1:551.463.21

SOUND FIELD OF A POINT SOURCE IN STRATIFIED MOVING TWO-COMPONENT MEDIUM

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian  
Vol 21, No 9, Sep 85 (manuscript received 13 Mar 84) pp 949-955

OSTASHEV, V. Ye., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] A method developed in two previous works for computation of sound pressure in a stratified ideally moving gas is extended to the case of a moving two-component medium. As an example of the use of the equations thus obtained, the field of a point source in a moving medium is analyzed. The problem of computing sound pressure in a stratified moving two-component medium is reduced to solution of a one-dimensional Helmholtz equation and subsequent computation of a Fourier integral. References 7: 6 Russian, 1 Western.  
[70-6508/12947]

UDC 551.521.3

TRANSFER OF RADIATION IN MODEL OF BROKEN CLOUD COVER CONSTRUCTED ON THE BASIS OF POISSON POINT FLUX

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian  
Vol 21, No 9, Sep 85 (manuscript received 19 Jan 84) pp 940-948

TITOV, G. A., Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences

[Abstract] Based on results obtained in a previous work, this article describes the transfer of optical radiation in a model of broken cloud cover with the Markov property in the direction of movement of a light quantum. Equations are derived for the moments of optical parameters in the statistically homogeneous, nonisotropic cloud field, which is modeled by a Poisson flow of points. In deriving the equation for moments of intensity in the Markov approximation with respect to statistical characteristics of the cloud field, the only assumption was factorization of n-point probability of presence of clouds for an ordered sequence of points on a single straight line. The

results indicate that the mean radiation characteristics of a statistically homogeneous, nonisotropic cloud field depend not only on the probability of presence and horizontal dimension of clouds, but also on the nature of anisotropy and amount of cloud cover. Figures 6; references: 11 Russian.  
[70-6508/12947]

UDC 551.521.31

#### LIGHT SCATTERING IN ATMOSPHERE WITH NONORTHOTROPIC UNDERLYING SURFACE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian  
Vol 21, No 9, Sep 85 (manuscript received 8 Feb 84) pp 928-933

ZUBOV, V. A. and MININ, I. N., Leningrad State University

[Abstract] Usually when solving problems related to light scattering in the atmosphere it is assumed that the surface of the planet is orthotropic, the intensity of light reflected from the surface not depending on direction. Actual surfaces have complex light reflection patterns. The main purpose of this article is quantitative estimation of the variation from orthotropy and formulation of conclusions and practical recommendations for such problems. The basic integral equations required for the analysis are derived and solved for several model cases. Recommendations for calculating gradient influx are presented. References 13: 11 Russian, 2 Western.  
[70-6508/12947]

UDC 551.510.42:519.688

#### PLANNING OF EXPERIMENT IN PROBLEM OF ESTIMATING INTENSITY OF POLLUTION SOURCES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian  
Vol 21, No 9, Sep 85 (manuscript received 11 Nov 83; after revision 4 Apr 84)  
pp 913-920

PENENKO, V. V., RAPUTA, V. F. and BYKOV, A. V., Computer Center, Siberian Department, USSR Academy of Sciences

[Abstract] A study is made of one element in an air pollution tracking system, an algorithm for estimating the output of pollution sources based on measurement data. A development and continuation of previous work, the article presents more complete regression models taking various hydrometeorological conditions into account. Methods are suggested for constructing continuous and discrete plans for the class of problems arising on the basis of pollutant transfer models. Numerical experiments are presented in the area of determining optimal measurement plans. The method suggested is of greatest interest for estimating the output of sources which are not accessible for direct observation, e.g., in problems of transfer of pollutants across borders,



as well as analysis of sources of complex configuration.. The apparatus developed in this article can also be used for problems requiring joint determination of the position and output power of pollution sources. Figures 2, tables 2; references: 7 Russian.  
[70-6508/12947]

ARCTIC AND ANTARCTIC RESEARCH

UDC 551.464.1

HYDROCHEMICAL INDICATORS OF FRONTAL CYCLONIC EDDY IN ANTARCTIC CIRCUMPOLAR CURRENT

Moscow OKEANOLOGIYA in Russian Vol 25, No 5, Sep-Oct 85  
(manuscript received 5 Oct 83) pp 740-743

CHERNYAKOVA, A. M. and BORODKIN, S. O., Oceanology Institute imeni  
P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] The 30th cruise of the research vessel "Dmitriy Mendeleev" studied synoptic variability of physical, chemical and biological parameters in sea water in relationship to eddy formation in the area of the Antarctic Circumpolar Current south of New Zealand. Analysis of the materials revealed an eddy formation, a cyclonic frontal ring, its area of formation and the evolution of its waters in time and space. The frontal cyclone was formed by separation of a meander of the southern branch of the Antarctic Circumpolar Current, then moved under the influence of the average current to the north-east, carrying an Antarctic water mass in its core. Meandering of the current is primarily related to bottom topography and is a constant source of eddies. Figures 4; references 3: 2 Russian, 1 Western.  
[72-6508/12947]

UDC 550.83

RELATIONSHIP OF ELASTIC MODULI OF MOISTURE-SATURATED FROZEN SANDY-CLAYEY ROCKS AND ICE

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA in  
Russian No 8, Aug 85 pp 85-89

FROLOV, A. D., Moscow Geological Prospecting Institute imeni Sergo  
Ordzhonikidze

[Abstract] Data are compared on the elastic properties of frozen sandy-clayey soils with full moisture saturation and porosity 40%, the level most frequently encountered in nature, and massive cryotexture. The influence of different types of cryotexture on the elastic modulus of frozen rock is not analyzed.

It is found that at temperatures below  $-2^{\circ}\text{C}$ , Young's modulus for frozen sands is 3.3-4 times greater than for fresh water ice. This is a result of the formation in the frozen sand of a three-dimensional biogenic structure with predominance of crystallization-condensation contacts between grains, due to the very low content of liquid phase in the frozen sands at temperatures below  $-2$  or  $-3^{\circ}\text{C}$  and the significantly smaller crystal size of the ice than in solid ice bodies. For clayey soils and saline ice, it is found that at  $-2$  to  $-10^{\circ}\text{C}$  the elastic modulus of clayey rock is significantly less than that for polycrystalline ice, resulting from the significant content of adsorbed liquid phase in the intergrain boundary zones. The interval of change of the elastic modulus in polycrystalline fresh water ice can be used to evaluate the elastic properties of moisture-saturated frozen rock and saline ice. Figures 1; references 14: 8 Russian, 6 Western.  
[32-6508/12947]

UDC 539.383

#### IMPACT FRACTURE OF ICE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 284, No 3, Sep 85  
(manuscript received 30 Oct 84) pp 599-603

YEPIFANOV, V. P., Mechanical Problems Institute, USSR Academy of Sciences, Moscow

[Abstract] A study is made of the collision of an ice plate with a spherical body. A new experimental method allows determination not only of the mechanical characteristics, but also of their changes in the process of the collision, and interchangeable fittings allow modeling of the impact interaction of engineering structures with an ice field. Experiments on the influence of temperature on the mechanism of penetration of a sphere into ice were performed at  $-1$  to  $-40^{\circ}\text{C}$ . The method allows an impact during the course of which the nature of the interaction changes, e. g., by formation of fractures. Figures 4; references 4: 3 Russian, 1 Western.  
[64-6508/12947]

GEODYNAMIC RECONSTRUCTIONS AS METHOD FOR PREDICTING OIL AND GAS CONTENT  
OF POORLY STUDIED REGIONS (AS EXEMPLIFIED BY ANTARCTIC)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOLOGICHESKAYA in Russian No 9,  
Sep 85 (manuscript received 23 Jan 85) pp 100-110

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[Abstract] Geodynamic reconstruction based on plate tectonics, in contrast to other geological analogy geological methods, allows the drawing of conclusions not only on the current status, but also the history of geological development of a region. This article demonstrates the capabilities and limitations of application of the method in the example of the least studied continent, Antarctica. The broad stratigraphic diversity of the sedimentary cover, great thickness of sediments and presumably great variety of conditions for oil and gas formation and accumulation, allow the shelf and transition zones of the Weddell Sea to be considered among the most highly promising in the Antarctic for the search for oil and gas. The use of the geodynamic reconstruction method based on lithospheric plate tectonics, even when direct correlation across the ocean is impossible, allows general prediction of the types of basins of poorly studied Antarctic continental margins, the specifics of their geological structure, age and nature of sedimentation and possible conditions of oil and gas formation. This allows orientation of prospecting, particularly geophysical, work in the search for submerged rift-stage grabens and other sedimentary complexes. Horst upthrusts of the basement and certain characteristic structures forming potential traps for hydrocarbons are defined, such as horst and monoclinial basement blocks in rift depressions. Figures 1; references 36: 8 Russian, 28 Western.  
[59-6508/12947]

NEW ARCTIC DRIFTING STATION, SP-28, PLANNED

Moscow IZVESTIYA in Russian 29 Nov 85 p.1

[Article by A. Ryabushev, Leningrad]

[Text] The USSR State Committee on Hydrometeorology and Monitoring of the Natural Environment, and the Central Committee of the All-Union Leninist Communist Youth League (Komsomol) have adopted a decision to create the third Komsomol drifting scientific research station. It will be the station "Severnny Polyus-28" (SP-28).

"The creation of the drifting scientific research station 'SP-28', at which scientific observations will be extensively automated, is very essential, and it will open up great prospects," said Nikolay Aleksandrovich Kornilov, deputy director of the Arctic and Antarctic Scientific Research Institute. "Its work will become an important part of Arctic exploration in the spirit of the program 'Intensifikatsiya-90'. Preparations are now in full swing for an upcoming winter mission by young polar explorers. A long-term agreement regarding the development of automated complexes and their introduction at drifting stations has been concluded with the Leningrad Polytechnic Institute. The creation of an automatic post for receiving and transmitting satellite information on ice conditions is also planned at 'SP-28'. The compilation and facsimile transmission of a map of the ice conditions of the entire Arctic basin will be done with the aid of a computer for the first time at a drifting station."

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DIVERS IN PRESSURE CHAMBER ON BOARD VESSEL 'SPRUT'

Moscow MEDITSINSKAYA GAZETA in Russian 18 Dec 85 p 4

[Text] An interesting experiment was performed in the Barents Sea. Specialists of the diving vessel "Sprut" descended to a record depth of 300 meters and carried out all planned work successfully. This vessel's divers worked in support of geologists who are doing exploratory drilling in the coastal zone of Arctic seas.

Hurricane-force winds, movements of ice masses and other natural factors can cause various breakdowns of drilling mechanisms, and such breakdowns have to be eliminated at various depths. Training dives must be made constantly under careful medical observation if work is to be done in such conditions. Divers of the vessel spent several days in a pressure chamber in maximum-load conditions before making their record dive.

(The photograph showed divers under the observation of physician B. Vlasov in a pressure chamber of the "Sprut", following the record dive.)

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## IL-18D AIRPLANE USED IN ANTARCTIC EXPLORATION AND TRANSPORT

Moscow VOZDUSHNYY TRANSPORT in Russian 21 Dec 85 p 2

[Article by T. Nikitina, correspondent]

[Excerpt] An IL-18D airplane [which recently returned to Leningrad] performed a good deal of service over the expanses of the Antarctic continent. Equipped with special instruments, it acquired a new occupation: it was used as a laboratory airplane. With the assistance of a crew headed by V. Shapkin, scientists of the USSR Academy of Sciences' "Sevmorgeologiya" (Northern Marine Geology) Research and Production Association and other organizations made comprehensive studies of interior areas of the continent that are difficult to reach. Many of these areas are covered with a layer of ice that is one kilometer thick. The use of the IL-18D as a laboratory airplane proved highly effective, making it possible to study large territories in a comparatively short period of time and to obtain valuable scientific data. Specialists of "Sevmorgeologiya" reported that this work will be advanced on a broader scale in the future, which will undoubtedly enrich our knowledge of the sixth continent.

In the fall of 1985, part of the polar explorers arrived in Maputo, Mozambique, from Moscow on a commercial flight of a TU-154 airplane. They then boarded the IL-18D, which made four more shuttle flights between the capital of Mozambique and the Antarctic station "Molodezhnaya", delivering another 160 members of the expedition to this station. More than 1,000 persons in all have been transported over this long-distance route during the [four] years it has been in operation.

The next flight over this super-long route of Aeroflot is planned in February of 1986. Instead of an IL-18D, a more modern IL-76 airplane, which has been re-outfitted as a passenger version, will set out for the first time over the long route to the sixth continent. A large new group of participants in the 31st Antarctic Expedition will leave for Antarctica on board the IL-76.

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SP-28 ARCTIC DRIFTING STATION TO START OPERATION IN APRIL

Moscow SOVETSKAYA ROSSIYA in Russian 28 Dec 85 p 2

[Article by I. Podshivalov]

[Excerpt] Next spring, the scientific research station "Severnnyy Polyus-28" will begin operation in the Arctic Ocean. It is being established at the initiative of Young Communist League (Komsomol) members who work at the Arctic and Antarctic Scientific Research Institute.

For the first time a minicomputer will be used on a drifting ice floe as the basis of a flexible automated complex for the gathering, processing and systematization of scientific observations. Meteorologists, oceanologists, an ice research group, aerologists, a satellite-information receiving service, and a climate and ocean-pollution monitoring service will be operating at the station. The results of the studies will contribute to the establishment of year-round shipping on the Northern Sea Route, and to the solution of certain problems related to the development of geological prospecting operations on the ocean shelf.

At present, as preparations are underway, the search for an ice floe is being conducted; the "Cosmos-1500" satellite is being used in this search. The Komsomol has assumed patronage of the enterprises which are producing the equipment for the SP-28 station, which will begin its work in April.

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